

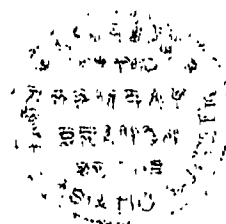
REPORT

OF THE

CHEMICAL ANALYSER TO GOVERNMENT, BOMBAY,

FOR THE YEAR 1890.

G. H. S.



Bombay:

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REPORT

OF THE

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FOR THE YEAR 1890.

To

THE SECRETARY TO GOVERNMENT,
General Department,
Bombay.

SIR,

I have the honour to submit the following report for the year 1890, being the twentieth Annual Report of this Department.

2. The work done by the department during the past year may be thus summarized :—353 medico-legal cases in the investigation of which 1,401 articles were examined ; 250 samples of potable water and 1,152 samples of Government stores and other articles classed as “Miscellaneous” were analysed, the gross total of articles under examination during the year under report being 2,803.

3. In the following table is shown the number of cases examined during the last five years arranged in their respective classes :—

Class.			1886.	1887.	1888.	1889.	1890.
Medico-legal cases	...	...	296	282	360	312	353
Potable waters	...	...	112	207	280	260	250
Government stores	...	...	444	355	500	221	298
Customs and Abkâri analyses	...	...	479	652	598	773	747
Miscellaneous	...	...	92	52	54	53	107
Total			1,423	1,548	1,792	1,619	1,755

From the above table it will be seen that the total number of cases for the past year was slightly less than the total for 1888 (the highest total on record), whereas the number of articles examined was greater by 255 than the corresponding number for the same year and nearly 500 greater than the number examined in 1889, the number of articles forwarded in connection with the medico-legal cases being responsible for this large increase in the work.

The same difficulty is felt, but to a greater extent than in previous years, in keeping pace with the incoming work, and the present staff of the Laboratory has been severely taxed to meet the demands for reports urgently required. The work of the department has now reached such dimensions that many tedious analyses have to be relegated to the shelves for weeks and even months, before time can be found to take them in hand, and in the absence of additional assistance, the necessity for which has been previously indicated, it is difficult to understand how, with the present rate of increase in the number of analyses required, the reports can be furnished within a reasonable period after receipt of the cases.

Section I.—Medico-Legal.

4. The medico-legal cases investigated by this department during the year 1890 were forwarded from 127 different stations and are arranged in three classes as follows :—Class (1) cases of suspected human poisoning ; Class (2) cases of suspected cattle-poisoning ; Class (3) miscellaneous cases, principally cases of

staining with blood, &c. The 353 medico-legal cases investigated during the year 1890 are referred to their respective classes as follows :—

Class 1	...	...	190 cases.
" 2	...	...	117 "
" 3	...	...	46 "

The following table gives the corresponding number of cases during the past five years :—

Class.	1886.	1887.	1888.	1889.	1890.
1. Suspected human poisoning	159	159	182	170	190
2. Do. cattle-poisoning	83	84	91	84	117
3. Blood stains, &c.,	54	39	87	58	46
Total	296	282	360	312	353

5. *Class I.—Cases of suspected human poisoning.*—Of the 190 cases belonging to this class, and investigated during the past year, poison was detected in 67 or about 35·3 per cent., a smaller percentage than last year. The following table shows the continuous decrease in the percentage of cases wherein poison was detected during the past five years :—

	1886.	1887.	1888.	1889.	1890.
Percentage of detections	55·9	52·8	46·2	36·8	35·3

6. In the following table is shown the nature of the poison found in each of the 67 cases of human poisoning in which poison was detected during the year under report. The cases are tabulated according to the districts from which they were forwarded :—

Districts.	Arsenic.	Pounded Glass.	Other Mineral Poisons.	Opium.	Dhatūra.	Other Organic Poisons.	Total.
Ahmedabad	...	...	...	1	...	...	1
Ahmednagar	5	...	1	...	...	1	7
Belgaum	...	2	...	...	...	...	2
Bombay	1	1	2	...	1	...	5
Broach	1	...	1	...	...	...	2
Dhárwār	2	...	1	...	1	...	4
Kaira	...	...	...	1	1	...	2
Kaládgi	4	...	1	...	...	...	5
Khándesh	3	...	2	...	...	...	5
Kolába...	...	1	...	...	...	...	1
Násik	...	2	1	1	...	...	4
Neemuch	...	...	...	...	...	...	...
Panch Maháls	2	...	1	...	...	1	4
Poona	1	...	1	4	...	1	7
Ratnágiri	1	...	...	...	...	...	1
Sátára	1	...	...	1	...	...	2
Sholápur	3	...	...	1	...	...	4
Sind	1	...	...	...	...	...	1
Surat	1	...	...	...	...	...	1
Thána	...	...	...	...	1	...	1
Total	26	6	11	9	4	3	59
Native States...	1	...	...	...	...	1	2
Central Provinces and Berárs.	5	...	...	...	...	1	6
Grand Total	32	6	11	9	4	5	67

7. As far as can be ascertained from the reports furnished to this office, the 67 cases of human poisoning in which some poison was detected during the past year included the poisoning of 87 persons, of whom 35 died. The following table shows the number of cases in which poison was detected, as well as the number of persons poisoned and the number of deaths during the past five years:—

	1886.	1887.	1888.	1889.	1890.
A.—Cases—					
Arsenic	47	42	41	33	32
Opium	12	14	15	20	9
Dhatura	4	5	5	3	4
Other poisons	26	23	23	10	22
Total Cases ...	89	84	84	66	67
B.—Persons poisoned—					
Arsenic	88	47	59	51	51
Opium	11	13	15	25	9
Dhatura	13	21	9	3	13
Other poisons	16	14	19	4	14
Total persons poisoned ...	128	95	102	83	87
C.—Deaths—					
Arsenic	31	20	26	14	21
Opium	11	13	14	18	9
Dhatura	...	2	1	2	2
Other poisons	8	2	7	1	3
Total Deaths ...	50	37	48	35	35

The figures from the above table give the following percentages of deaths for each poison in the cases where the poison was actually detected:—

Arsenic	65.6 per cent.
Opium	100.0 "
Dhatura	50 "
Other poisons	13.6 "

It will be observed that the percentage of deaths from arsenic and opium is considerably larger than those for the previous year, the percentages for that year being 42.4 and 90.0 for arsenic and opium respectively.

8. The following is a detailed statement showing the poison found in each of the 67 cases of Class I above referred to:—

Arsenious oxide	32
Calcium	2
Copper	5
Lead	2
Mercury	2
Pounded glass	6
Cannabis Indica	1
Opium	9
Dhatura	4
Strychnia	1
Other alkaloids	2
Alcohol	1
Total ...	67

9. *Arsenic*.—Of the 32 cases in which this poison was found during the past year, 6 were cases in which more than one person was poisoned. These 6 cases include 3 deaths, all of which were men. The following is a summary of these 6 cases:—(1) a case from Ahmednagar in which three persons, after partaking of some cakes given them by a woman, suffered from pain and vomiting, and arsenic was found both in the cakes and vomit: all recovered.

(2) A case from Dápoli (Ratnágiri District) where thirteen persons were poisoned by sugar containing arsenic; all exhibited symptoms of irritant poisoning but eventually recovered: (3) a case from Bársi (Sholápur District) in which ten persons who partook of the same food displayed irritant symptoms, one dying; this man, after eating his food, walked three miles and died under a tree; his body was exhumed after five days and the viscera forwarded for examination, when arsenic was found to be present: (4) a case from Párner (Ahmednagar District) in which a man who, after eating a portion of his food, suspected that there was something wrong with it and gave some to his daughter; both vomited and arsenic was detected in the bread cakes of which they had partaken and in the vomit: (5) a case from Nandurbár (Khándesh District) where two men died after eating together; both suffered from vomiting and purging and died on the second and third day respectively, after having taken the poisoned food; arsenic was detected in the viscera of both men, as much as 7 grains of pure arsenious oxide being obtained by washing from the stomach of one of the deceased: (6) a case from Navalgund (Dhárwár District) in which several people suffered from pain and exhibited other irritant symptoms after eating some sugar; all recovered; arsenic was found in the sugar.

10. In the remaining 26 cases in which arsenic was detected during the past year, 18 were fatal cases in each of which one person was poisoned and the remainder were samples of food and powders containing arsenic. Of the 18 fatal cases, 9 were men, 7 women, and 2 children. Of the 9 cases in which male adults were poisoned, 8 appear to be homicidal, and in 1 no history was obtainable. These 9 cases were:—(1) a case from Shevgaon (Ahmednagar District) in which a man died after irritant symptoms—he was said to have been at enmity with his wife but no further history is afforded: (2) a case from Tando Bago (Sind District) in which a man died after eating bread, found, on examination, to contain arsenious oxide: (3) a case from Bhopawar (Central India); in this case the vomit of the deceased was forwarded for analysis and was found to contain arsenic: (4) a case from Gadag (Dhárwár District) in which a man after partaking of food in his cousin's house, exhibited symptoms of irritant poisoning and died shortly afterwards: (5) a case from Sholápur: (6) a case from Bijápur in which the symptoms and *post-mortem* appearances pointed to irritant poisoning as the cause of death, and 6 grains of arsenious oxide were found on analysis in the stomach of the deceased: (7 and 8) two cases from Wun (Berár), where arsenic was found in the stomach and in the food in the first case, and in the second case no history was given: (9) a case from Sávantvádi (Southern Marátha Jághirs) in which a man who was given food by his wife died after irritant symptoms, arsenic being found in his viscera. Of the 7 cases among female adults, 5 appear to be homicidal and in the remaining cases no history was given. These cases were:—(10) a case from Bombay in which the viscera and a quantity of dry tea were sent for analysis; the stomach was found to contain as much as 60 grains of arsenious oxide; this poison was also detected in the tea sent for examination: (11 and 12) two cases from Kálol (Panch Maháls); in the first of these cases, a woman died on her way to her father's house; she had previously been given some sugar to eat by her husband. The second was apparently an exhumation case. In both of these arsenic was detected in the viscera of the deceased: (13) a case from Akola (Berár): (14) a case from Ellichpur (Berár): (15) a case from Sánda (Khándesh District); in neither of these cases was there any special point of interest: (16) a case from Indi (Kaládgi District) in which a woman and her dog both ate the same food; the woman died and the dog, after vomiting, recovered; arsenic was found in both the viscera of the woman and the vomit of the dog. The two fatal cases in children were (17) a case from Ahmednagar: (18) a case from Erandol (Khandesh District); in the former case no history was given and in the latter a girl aged nine died after displaying the usual irritant symptoms.

11. From the last two paragraphs it will be seen that the 18 deaths from arsenical poisoning were thus distributed:—five occurred in the Central Provinces and Berárs and two in Ahmednagar, Khándesh and Panch Maháls and one in each of the following districts:—Bijápur, Bombay, Dhárwár, Kaládgi, Sholápur, Sind and Southern Marátha Jághirs.

12. The remaining 7 cases in which arsenic was detected were as follows :—(1) a case from Bijápúr in which some sugar which was given by one woman to another to eat, caused a tingling sensation in her mouth which aroused her suspicions and she did not swallow it; arsenious oxide was found in the sugar: (3) a case from Broach in which four powders were sent for examination and were respectively found to consist—two of arsenious oxide, a third of corrosive sublimate and the fourth of sulphate of lime; no history was given: (3 and 4) two cases from Bágalkot (Kaládgi District); in the first case, two packets containing “white arsenic” being forwarded and in the second case flour, found to be mixed with arsenic: (5) a case from Surat in which some seeds were found to be mixed with arsenious oxide: (6) a case from Párner (Ahmednagar District) in which bread cakes were found to contain 168 grains per lb.; no history was given of this case: (7) a case from Sirúr (Poona District) in which flour containing arsenic was forwarded for analysis.

13. *Pounded Glass*.—This was found in 6 cases forwarded to this office for examination during the year under report; all were apparently attempted homicide. These were:—(1) a case from Pen (Kolába District) in which bread cakes were found to contain fragments of rose-coloured glass: (2 and 3) two cases from Athni (Belgaum District) in which cooked food was found in each case to contain particles of green and red glass; (4 and 5) two cases from Pimpalgaon (Násik District) in which powders found upon accused, were found to contain blue and green glass particles; in one case the glass was mixed with seeds of *Argemone Mexicana*: (6) a case from Bombay in which a powder was found to contain blue glass fragments. In all of the above cases the source of the glass was probably pounded glass bangles and apparently all were attempts by women to poison their husbands.

14. *Copper*.—In five cases this poison was employed; these were: (1) a case from Bombay in which rice and curry which a woman had given to a man, were found to contain blue vitriol, and the latter was also found adhering to the stones with which it had been pounded: (2) a case from Mehmedabad (Kaira District) in which copper was detected in food and vomit: (3) a case from Dhárwár in which milk sent for analysis, was found to contain 12 grains per pint of sulphate of copper: (4) a case from Bhusával (Khándesh District) forwarded by the Medical Officer in charge of the G. I. P. Railway at that station, in which a brass pot, a powder and some liquid matter were each found to contain copper: (5) a case from Sangamner (Ahmednagar District) in which some clothes were forwarded for examination in a case of suspected criminal abortion, together with two packets containing powders which gave the characteristic copper sulphate reactions.

15. *Mercury*.—The two cases in which this poison was used were (1) a case from Broach in which a person who had been given a piece of sweetmeat, complained of burning of the throat and difficulty in swallowing, but eventually recovered: (2) a case from Bijápúr in which seven powders were forwarded for examination and report, relative to the death of a woman from suspected criminal abortion. One of these powders was found to contain corrosive sublimate, a second ferrous sulphate, and the remainder were vegetable powders.

16. *Lead*.—This poison was used in two cases—(1) a case from Bombay, (2) a case from Indápúr (Poona District); no notes of these cases were forwarded.

17. *Opium*.—Nine cases were forwarded for investigation in which opium was detected. Of these, 3 were suicidal (including two men and one woman), and in the remaining 6 no history was afforded. In each of the nine cases one person was poisoned and with a fatal result. Of these, 2 were female adults and 7 were male adults. The 3 cases of suicide were (1) a case from Násik, (2) a case from Khed (Poona District), (3) a case from Bársi (Sholápur District). The remaining cases, with respect to which no history was available, were:—(4) a case from Sátára, (5, 6, and 7) three cases from Poona, (8) a case from Borsad (Kaira District), (9) a case from Dholka (Ahmedabad District). The 9 cases in which opium was detected were thus distributed:—4 from Poona and one each from Ahmedabad, Kaira, Násik, Sátára and Sholápur districts.

18. *Dhatūra*.—Four cases of poisoning by this drug were sent for examination during the past year. These 4 cases include the poisoning of thirteen persons. These cases were:—(1) a case from Háveri (Dhárwár District) in which eight persons after eating their food became drowsy and otherwise exhibited symptoms of narcotic poisoning, all eventually recovering; (2) a case from Thána in which a woman had died suddenly; no history of this case was available beyond the fact that the deceased had suffered from abdominal pain; (3) a fatal case from Borsad (Kaira District) in which no notes were obtainable; (4) a case from Bombay in which a brass pot containing crushed dhatūra seeds was forwarded for examination of the seeds—this case was in connection with the poisoning of three women who were treated afterwards in the Sir Jamsetji Jeejeebhoy Hospital.

19. *Strychnia*.—One case of strychnia poisoning was examined during the past year: this came from Kárwár (Kánara District). A powder was sent for analysis in this case in which two persons had been poisoned and one had died; strychnia was found in the powder forwarded.

20. *Other Poisons*.—Six cases are included under this head. These were: (1) a case from Ahmednagar in which two bottles of aerated water and three samples of tinned food, viz. sardines, oysters, and salmon were sent for examination; all three samples of tinned food were found to be putrid and to such an extent that there was hardly any organized tissue visible; (2) a case from Dohad (Panch Maháls) in which some sweetmeat sent for analysis was found to contain 4 grains per ounce of Cannabis Indica; (3) a fatal case from Junnar (Poona District) in which a vegetable alkaloid not answering to the tests of any known alkaloid was detected in the viscera of the deceased man; (4) a fatal case from Hingoli (Hyderabad, Deccan) in which alcohol was probably the poison which produced the fatal result; (5 and 6) two cases from Bhadgaon (Kháudesh District) and Pimpalgaon (Násik District) respectively, where salts of lime were detected in the powders forwarded for examination.

21. 123 cases of suspected attempt at human poisoning in which no poison could be detected were forwarded for investigation during the past year. Of these 123 cases, 78 were cases in which the viscera of the deceased were forwarded for examination. These 78 cases may be thus classed:—

A.—Cases where death was probably due to disease or injury.

B.—Doubtful cases, where there was suspicion of poison, but with respect to which no information was obtained, either by *post-mortem* examination or analysis.

C.—Cases where the cause of death was unknown, but referred for confirmation as to the absence of poison.

Of the 78 cases above referred to, 12 belong to Class A, 51 to Class B, and 15 to Class C. The 12 cases belonging to Class A include deaths probably due to the following diseases and injuries: 2 to hanging, 6 drowning, 1 apoplexy, 1 collapse after long continued fever, 1 valvular disease of the heart, and 1 pneumonia. Of these 12 fatal cases, 6 were men, 4 women, and 2 children. The 8 cases of death by hanging and drowning comprised 3 women, 3 men and 2 children.

22. The 51 cases of Class B include all those in which, in the absence of any symptoms of disease or of any distinctive *post-mortem* appearances accounting for death, suspicion had been directed to poison as the possible cause of death. These 51 cases include 51 deaths, of which 37 were men, 12 women and 2 children.

23. The 15 remaining cases classed under the head of C were cases in which no suspicion of poison was entertained, but at the same time no symptoms of disease were present. These were principally cases of sudden death or of those where a corpse was found without any indication as to the cause of death. Of these, 10 were men, 3 women and 2 children. Hardly any information was afforded in any of these cases beyond the fact that the person was "found dead."

24. In 35 cases matters other than viscera were forwarded for examination in which no poison could be detected. In 10 of these, vomited

matter was submitted for analysis; in 16, articles of food; in 2, the bones of exhumed bodies; and in 1, the ashes of a cremated body. In one case, a powder supposed to possess abortifacient properties was forwarded for examination. In another case, two stones supposed to have fragments of dhatura seeds adhering to them, were sent for analysis, in connection with a case in which three persons had exhibited narcotic symptoms after partaking of the same food. A case from Bombay, in which several samples of castor-oil were submitted for examination, a child having died after taking a dose of the oil, and death having been attributed to the oil. Two cases in which water suspected to contain poison was sent for analysis, and lastly, a case in which fæcal matter and urine in a case of suspected poisoning, were found, upon examination, to be free from poison.

25. *Cases of suspected Cattle Poisoning.*—117 cases of this class were forwarded for investigation and report during the past year. This is the largest number of cases of this class ever referred to this office for examination. Of the 117 cases, poison was detected in 63, this figure being also higher than in any previous year. As far as can be ascertained from the information supplied to this office, the 63 cases in which some poison was detected included the fatal poisoning of 58 animals, 55 of these being horned cattle, 2 dogs and 1 leopard, the latter being forwarded from the Victoria Gardens, Parel. The following table shows the corresponding numbers for the past five years:—

Year.				1886.	1887.	1888.	1889.	1890.
Number of cases referred ...				83	84	91	84	117
Number of detections ...				45	50	53	51	63
<i>Animals killed.</i>								
Ahmednagar ...	...	...	...	6	16	15	3	7
Belgaum ...	...	...	...	3	2	6	1	3
Bijapur ...	...	...	...	4	...	2	...	...
Khândesh ...	...	...	...	3	1	3	...	1
Násik... ..	...	...	...	5	3	8	7	3
Poona	...	...	...	6	8	3	5	3
Sátára	...	...	...	4	...	8	7	11
Sholápur ...	...	...	...	13	9	3	18	14
Surat... ..	...	...	...	2	2	...	7	3
Other districts ...	...	...	...	9	16	15	9	13
Total animals killed ...				55	57	63	57	58

26. In 11 of the cases in which poison was detected, more than one animal died from the effects of poison. One of these cases, in which four animals were killed, came from Ahmednagar; in another case from Pusesávli (Sátára District) three animals died; in the remaining 9 cases, 2 were killed in each case; these came from the following districts:—3 from Kaládgi, 2 from Sátára and 1 from each of the following districts—Alibág, Dhárwár, Násik and Southern Marátha Jágirs. Of the 63 cases in which poison was detected, in 20 the poison consisted of the seeds of *Cerbera Thevetia* (yellow oleander); in 2 of strychnia; in 1 of sulphate of copper (blue vitriol); and in 1 of redlead: in the remaining 39 cases the poison employed was arsenious oxide (white arsenic).

27. *Cases of suspected staining with Blood, &c.*—46 cases were forwarded for examination and report during the year. Of these, 29 were cases of suspected staining with blood, and the remaining 17 were suspected of bearing stains of semen. The total number of articles examined in connection with both these classes was 202. Blood stains were found upon the articles forwarded in 26 out of the 29 cases above referred to, in 12 instances being found upon articles of clothing only, and in 14 on weapons, &c. Of the 26 cases in which blood was detected, 8 were apparently homicidal cases and in the remainder no history was given.

28. Of the 17 cases of suspected seminal staining, in 1 only was the existence of semen detected and in this blood stains were also found. In 7 other cases of this class, blood stain was detected, but without any evidence of the presence of semen.

29. I have again to call attention to the very unsatisfactory reports forwarded with the cases sent for analysis, which are still in many cases very carelessly prepared, and the necessary order from the Magistrate is so frequently neglected that in quite one-fourth of all cases forwarded, this has to be asked for, the clerical work of the Department being thus considerably and unnecessarily increased.

Section II.—Potable Waters.

30. During the past year 250 samples of water were forwarded to this office for examination and report respecting their suitability, or otherwise, for drinking purposes. This is somewhat lower than the corresponding number of waters analysed during the preceding year. The corresponding figures for the past five years are as follows:—

1886	...	...	...	112
1887	...	...	...	207
1888	...	...	...	280
1889	...	...	...	260
1890	...	...	...	250

Of the 250 samples forwarded, 143 are classed as bad. The following table gives a summary of the results obtained:—

Number.	Station.	Date of collection.	Source.	GRAINS PER GALLON.		PARTS PER MILLION.		Sediment.	Column added by order of Government.	By whom sent, and Remarks.
				Total Solids.	Chlorine.	Ammonia.				
						Free.	Albumenoid.			
1	Abu Road	March	Pátan well	81.2	23.80	.04	.80	Scanty, vegetable debris	Bad	Executive Engineer.
2	Do.	April	Railway School well	14.6	2.03	.00	.06	Do. paramacia	Good	Agent, B. B. & C. I. Railway.
3	Do.	August	Do. do.	9.8	1.82	.04	.11	Do. do.	Bad	Executive Engineer, R. M. Railway.
4	Ahmedabad	February	Panchkuwa well	126.7	26.04	.07	.10	Do. vegetable debris	Do.	Secretary, Municipality.
5	Do.	January	Source not stated, No. 1	28.0	6.02	.51	.16	Do. rotifers	Do.	Collector.
6	Do.	Do.	Do. No. 2	32.8	5.60	2.49	.81	Do. do.	Do.	
7	Do.	Do.	Do. No. 3	32.3	5.46	.00	.05	Do. do.	Good	
8	Do.	Do.	Do. No. 4	26.6	5.32	.08	.12	Do. do.	Fair	
9	Do.	Do.	Rájesar tank	76.3	26.18	.01	.09	Abundant, vegetable debris.	Bad	Executive Engineer.
10	Do.	Do.	Central well	123.9	48.44	.08	.07	Do. do.	Do.	
11	Do.	Do.	Well	161.7	68.32	.06	.08	Do. do.	Do.	
12	Do.	April	Panchkuwa well	154.7	25.83	.11	.14	Scanty, paramacia	Bad	
13	Do.	Do.	River water, No. 1	31.2	6.44	.06	.14	Do. do.	Fair	Collector.
14	Do.	Do.	Do. No. 2	30.8	6.02	.02	.11	Do. vegetable debris	Do.	
15	Do.	Do.	Do. No. 3	35.7	6.02	.00	.09	Do. do.	Good	
16	Do.	Do.	Do. No. 4	35.0	6.30	.05	.15	Do. do.	Bad	
17	Do.	May	European Infantry well	32.9	4.06	.24	.06	Do. do.	Do.	Medical Officer, Station Hospital.
18	Do.	July	Well	32.2	1.61	.00	.07	Do. do.	Fair	Medical Officer of Camp.
19	Do.	June	Do.	32.2	2.31	.00	.10	Do. paramacia	Do.	
20	Do.	Do.	Do.	30.8	2.10	.00	.04	Do. do.	Do.	
21	Do.	Do.	Do.	30.8	2.10	.00	.15	Do. do.	Bad	
22	Do.	August	Regimental well	36.4	4.41	.09	.06	Do. do.	Fair	Medical Officer, Camp.
23	Do.	December	Filtered water	31.5	5.67	.12	.11	Do. do.	Bad	
24	Do.	Do.	Unfiltered river water	35.0	5.74	.16	.17	Do. rotifers	Do.	
25	Do.	Do.	New well	54.6	9.94	.01	.11	Do. do.	Do.	
26	Ahmednagar	February	Bahatari tank	10.5	.98	.19	.22	Do. paramacia	Do.	Senior Medical Officer.
27	Do.	Do.	Shapar reservoir	18.9	.77	.01	.03	Do. do.	Good	
28	Do.	Do.	Well in nala	18.9	1.05	.17	.15	Do. do.	Bad	
29	Do.	Do.	Do. do.	22.4	1.12	.15	.09	Do. do.	Do.	
30	Do.	March	Mahratta's well	32.9	1.54	1.65	2.01	Abundant, paramacia	Do.	Deputy Collector.
31	Do.	Do.	Mulan's do.	32.2	1.40	1.00	1.99	Do. do.	Do.	
32	Do.	Do.	Bráhmín's do.	40.6	1.61	.03	1.30	Do. do.	Do.	
33	Do.	Do.	Sutár's do.	25.2	.70	.12	.26	Do. do.	Do.	
34	Do.	April	Jamidár's do.	19.6	2.45	.00	.15	Copious, do.	Fair	Deputy Collector.
35	Do.	Do.	Shukarwar Peit well	24.5	2.03	.00	.18	Scanty, do.	Bad	
36	Do.	Do.	Nimhalkar's well	16.8	1.63	.04	.19	Do. vegetable debris	Do.	
37	Do.	Do.	Kasár's do.	26.6	2.31	.01	.10	Copious, paramacia	Fair	
38	Do.	Do.	River Prawára	31.5	11.29	.04	.13	Scanty, do.	Bad	Deputy Collector.
39	Do.	Do.	Do. do.	21.0	6.16	.00	.10	Do. vegetable debris	Fair	
40	Do.	Do.	Do. Mhalungi	16.8	8.40	.00	.09	Do. paramacia	Do.	
41	Do.	Do.	Do. Adala	31.5	11.34	.12	.24	Do. voricella	Bad	
42	Do.	May	Ráhuri	19.6	2.80	.64	.32	Do. rotifers and paramacia	Do.	Deputy Collector.
43	Do.	Do.	Pathare	63.0	12.46	.00	.08	Do. do.	Do.	
44	Do.	Do.	Kolhar Khurd	63.4	12.46	1.07	.24	Do. do.	Do.	
45	Do.	Do.	Pachegaon	44.1	8.33	.53	.25	Do. do.	Do.	
46	Do.	June	Puntambe water	27.3	7.77	.03	.16	Do. vegetable debris	Do.	Deputy Collector.
47	Do.	Do.	Astagaon do.	2.3	5.22	.00	.16	Do. monads	Do.	
48	Do.	Do.	Kokamthan water	42.0	11.66	.04	.32	Do. algæ	Do.	
49	Do.	Do.	Saval do.	3.3	2.24	.00	.13	Do. monids	Do.	
50	Do.	Do.	Usunde Talúka	23.1	1.54	.80	.45	Do. entomostraca	Do.	Deputy Collector.
51	Do.	Do.	Mirajgaon Talúka	99.4	11.24	.40	.10	Do. paramacia	Do.	
52	Do.	Do.	Nimagaon do.	18.2	1.47	1.33	.60	Copious, monads	Do.	
53	Do.	Do.	Loni, Masatpur Talúka	2.0	2.03	.03	.34	Scanty, desmidsia	Do.	
54	Ajmeergarh	March	Source not stated	2.0	.6	.05	.06	Do. monads	Good	Medical Officer, Sanitarium.
55	Do.	Do.	Do. do.	11.9	.49	.03	.03	Do. do.	Do.	

Number.	Station.	Date of collection.	Source.	GRAINS PER GALLON.		PARTS PER MILLION.		Sediment.	Column added by order of Government.	By whom sent, and Remarks.
				Total Solids.	Chlorine.	Ammonia.				
						Free.	Albumenoid.			
56	Ajmere	September	Bandi Wadi	14.7	3.15	.27	.62	Copious, vegetable debris	Bad	Executive Engineer.
57	Do.	Do.	Anasagar	26.6	8.47	1.07	.46	Scanty, paramacia	Do.	
58	Do.	Do.	Hydrant	30.1	8.40	.00	.56	Do. nematoda	Do.	
59	Do.	Do.	Anasagar tank	30.8	8.75	.16	.56	Do. monads	Do.	
60	Do.	December	Madar Hill well	19.6	3.01	.05	.07	Do. paramacia	Fair	First Assistant Collector.
61	Akola	July	Stream	32.9	3.71	.00	.07	Do. vegetable debris	Do.	
62	Belgaum	February	Gudud-Bhani well	5.6	2.17	.09	.07	Do. paramacia	Do.	
63	Do.	May	Nipani water	21.7	.84	.05	.09	Do. do.	Do.	
64	Do.	Do.	Chikodi do.	23.1	1.68	.01	.07	Do. do.	Good	Deputy Collector.
65	Do.	Do.	Yamkanmardi water	11.2	1.26	.01	.13	Do. do.	Bad	
66	Do.	June	Hajjam Gully well	21.7	4.48	.32	.10	Do. do.	Do.	
67	Do.	Do.	Syed Ameer's do.	9.8	1.19	.24	.08	Copious, do.	Do.	
68	Do.	Do.	Abdul Rasal's do.	15.4	2.38	.27	.08	Scanty, do. and rotifers.	Do.	Cantonment Magistrate.
69	Do.	Do.	Charcoal Lines do.	17.5	1.05	.13	.06	Do. do.	Fair	Mamlatdar.
70	Rhiwadi	April	Verfala tank	6.3	1.12	.08	.44	Do. vegetable debris	Bad	
71	Bolarum	June	Jeedimutta stream	18.9	1.40	.08	.34	Do. do.	Do.	
72	Do.	Do.	Do. pit No. 1	27.3	1.68	.01	.06	Do. do.	Fair	
73	Do.	Do.	Do. pit No. 2	35.0	3.01	.04	.13	Do. paramacia	Bad	Executive Engineer.
74	Do.	Do.	Do. pit No. 3	42.0	2.52	.00	.09	Do. actinophrys soil and rotifers.	Fair	
75	Bolarum	July	Quarter Guard well	20.3	.77	.15	.10	Scanty, paramacia and rotifers.	Bad	
76	Do.	Do.	Residency	18.9	1.26	.00	.12	Do. confervæ and paramacia.	Do.	
77	Bombay	February	Tansa water works No. 1	4.2	.98	.09	.24	Do. vegetable debris	Do.	Executive Engineer, Tansa Water Works.
78	Do.	Do.	Do. do. No. 2	3.5	1.05	.29	.20	Do. do.	Do.	
79	Do.	Do.	Do. do. No. 3	4.2	.70	.16	.14	Do. do.	Do.	
80	Do.	June	Pawai lake	11.9	.98	.12	.20	Do. do.	Do.	
81	Do.	Do.	Do.	5.6	.91	.12	.19	Do. do.	Do.	Municipal Commissioner.
82	Do.	Do.	Vehar water	9.1	.98	.04	.15	Do. do.	Do.	
83	Do.	July	Pir Pao	12.6	1.19	.13	.28	Do. paramacia	Do.	
84	Do.	Do.	Do.	20.3	1.75	.09	.08	Do. and vorticella	Fair	
85	Do.	August	Pawai tank	9.8	.84	.08	.11	Abundant, confervæ	Bad	Municipal Commissioner.
86	Do.	Do.	Bhandarwara reservoir	4.2	.84	.00	.08	Scanty, amœbæ	Fair	
87	Do.	November	Arnalla Island	37.8	6.90	.05	.10	Do. paramacia	Do.	
88	Do.	Do.	Do.	30.8	5.74	.05	.20	Do. do.	Bad	
89	Do.	October	Well at Loni	35.0	3.36	.03	.07	Nil	Good	Consulting Engineer, G. I. P. Railway.
90	Do.	Do.	Do.	37.8	3.08	.01	.06	Do. do.	Do.	
91	Do.	Do.	Do.	30.1	1.12	.00	.07	Do. do.	Do.	
92	Do.	Do.	Do.	36.4	3.29	.00	.09	Do. do.	Fair	
93	Deesa	Do.	Well	30.8	4.60	.08	.14	Scanty, paramacia	Bad	Chief Commissariat Officer.
94	Dharwar	April	Bibadi well	23.8	2.10	.01	.08	Do. vegetable debris	Fair	Agent, S. M. Railway.
95	Do.	Do.	Arsekeri well	63.7	9.10	.04	.07	Do. vorticella, paramacia	Bad	
96	Do.	November	Do. do.	27.3	5.11	.01	.41	Do. paramacia	Do.	
97	Dhulia	May	Dedargan tank	18.9	2.10	.00	.06	Do. vegetable debris	Good	
98	Do.	June	Do. nala	30.1	2.17	.04	.14	Do. paramacia	Bad	Overseer, Water Works.
99	Gokak	May	Yadrad water	69.3	8.19	.05	.11	Copious, paramacia	Bad	
100	Do.	Do.	Gokak do.	23.0	2.80	.04	.17	Do. vegetable debris	Do.	
101	Do.	June	River water	7.7	.84	.04	.10	Do. do.	Fair	
102	Do.	Do.	Reservoir water	10.5	.98	.01	.08	Do. do.	Do.	Superintendent, Convict Gang.
103	Haveli	Do.	Spring do.	10.5	.98	.53	.48	Do. do.	Bad	
104	Hyderabad	July	Stream	45.6	5.46	.13	.52	Scanty, paramacia	Do.	
105	Do.	Do.	Pit	67.7	2.45	.32	.08	Copious, vegetable debris	Do.	
106	Do.	August	Stream	10.6	.63	.01	.17	Scanty, vegetable debris	Do.	Executive Engineer.
107	Do.	Do.	Infantry well	10.6	.84	.00	.11	Do. do.	Fair	
108	Jaigaon	April	Lower Nichran tank	13.3	.70	.04	.09	Copious, vegetable debris and clay.	Do.	
109	Do.	Do.	Upper do.	6.3	.70	.09	.24	Do. do.	Bad	Assistant Executive Engineer, Khândesh.
110	Do.	Do.	Town water	14.9	.70	.00	.08	Do. do.	Good	
111	Janjira	March	Site above dam	2.1	.84	.11	.10	Scanty, paramacia	Fair	
112	Do.	Do.	Garhi stream	2.1	.84	.04	.09	Do. vegetable debris	Do.	
113	Jubbulpur	January	Nira Canal	13.3	.98	.40	.15	Copious, confervæ diatoms.	Bad	Executive Engineer, Nira Canal.
114	Do.	Do.	Canal	9.1	.98	.07	.10	Do. vegetable debris	Fair	
115	Karachi	June	Dadu	21.7	1.33	.07	.09	Scanty, paramacia	Do.	
116	Do.	Do.	Roti	43.4	3.22	.13	.09	Do. do.	Bad	
117	Do.	September	Do. well	21.0	1.82	.08	.17	Do. vegetable debris	Do.	Deputy Surgeon-General.
118	Do.	November	Do. do. new	21.0	2.66	.03	.12	Do. vorticella	Fair	
119	Do.	Do.	Do. do. old	56.7	5.81	.00	.02	Do. vegetable debris	Bad	
120	Do.	Do.	New well, Roti	23.1	3.36	.05	.15	Do. do.	Do.	
121	Do.	December	Do.	26.6	3.57	.12	.13	Do. do.	Do.	Executive Engineer.
122	Khândesh	July	Dedargan nala	20.3	1.68	.04	.17	Do. do.	Bad	
123	Do.	August	Do. do.	19.6	1.59	.04	.12	Do. paramacia	Do.	
124	Do.	September	Do. do.	25.9	1.89	.04	.13	Scanty, paramacia	Bad	
125	Do.	October	Do. do.	19.6	1.82	.03	.08	Do. vegetable debris	Fair	Executive Engineer.
126	Do.	November	Do. do.	17.5	2.45	.04	.12	Do. paramacia	Do.	
127	Do.	December	Do. do.	23.8	2.17	.04	.08	Do. vegetable debris	Do.	
128	Kotah	November	Rampur tank	9.1	1.26	.01	.52	Copious, paramacia	Bad	
129	Do.	Do.	River Chambul	11.2	1.12	.00	.09	Scanty, do.	Fair	Agency Surgeon.
130	Mehsana	January	Samala well, east side	147.7	71.40	.13	.24	Copious	Bad	
131	Do.	Do.	Do. west do.	332.5	155.40	.48	.25	Do.	Do.	
132	Do.	Do.	Nadiana	3005.1	1008.00	.15	.78	Do.	Do.	
133	Do.	Do.	Jatana well, east side	70.7	28.00	.27	.14	Do.	Do.	Assistant Engineer, R. M. Railway.
134	Do.	Do.	Do. west do.	344.4	140.00	1.60	.84	Do.	Do.	
135	Do.	Do.	Boriani well	956.9	484.40	.40	.26	Do.	Do.	
136	Do.	Do.	Detroj	161.0	57.40	.20	.46	Do.	Do.	
137	Do.	Do.	Rampura Station well	393.2	198.20	.19	.14	Do.	Do.	Deputy Surgeon-General.
138	Mhow	July	Baircha tank	14.0	.77	.00	.18	Scanty, vegetable debris	Bad	
139	Do.	Do.	Do.	12.6	.70	.00	.18	Do. confervæ	Do.	
140	Nagpur	Do.	Ambagheri reservoir	7.7	.42	.08	.15	Do. vegetable debris	Do.	
141	Do.	Do.	Drinking fountain	9.1	.49	.05	.15	Do. do.	Do.	Engineer in charge Water Works.
142	Do.	Do.	Private tap	14.0	.63	.04	.12	Do. do.	Do.	
143	Do.	September	Dhobi tank, Gamlighar	17.5	.49	1.96	.44	Do. Confervæ and paramacia.	Bad	
144	Do.	Do.	Brahmini do. do.	13.3	.49	.08	.30	Do. paramacia	Do.	General Officer Commanding.
145	Do.	November	Ambagheri reservoir	7.0	.49	.01	.10	Do. vegetable debris	Fair	
146	Do.	Do.	Public drinking fountain	2.8	.42	.01	.05	Do. paramacia	Good	
147	Do.	Do.	Private tap	4.2	.49	.03	.05	Do. vegetable debris	Do.	
148	Nasirabad	June	Dooda well	72.1	16.38	.05	.24	Do. do.	Bad	Medical Officer, Station Hospital.
149	Do.	Do.	Jamun do.	60.2	15.12	.09	.09	Do. do.	Do.	
150	Do.	Do.	Danta do.	65.1	16.38	.17	.05	Do. do.	Do.	
151	Do.	Do.	Thakur's well	103.5	29.12	.03	.73	Copious, do.	Do.	
152	Do.	August	Private well	102.9	26.18	.16	.18	Scanty, paramacia	Do.	Medical Officer, 2nd Lancers
153	Neemuch	June	Well	71.4	14.98	.04	.09	Do. do.	Do.	

Number.	Station.	Date of collection.	Source.	GRAINS PER GALLON.		PARTS PER MILLION.		Sediment.	Column added by order of Government.	By whom sent, and Remarks.
				Total Solids.	Chlorine.	Ammonia.				
						Free.	Albumenoid.			
154	Pandharpur...	November	Ashah tank	11.2	1.26	.21	.33	Scanty, amœbæ, &c. ..	Bad ..	Assistant Surgeon, Dispensary.
155	Pârola ..	April	Well No. 1	16.8	1.05	.48	.13	Copious, paramœcia ..	Do. ..	Chairman, Municipality,
156	Do. ..	Do.	Do. No. 2	20.3	1.05	.27	.11	Do. do. ..	Do. ..	
157	Do. ..	Do.	Do. No. 3	25.2	1.61	.09	.11	Do. do. ..	Fair ..	
158	Do. ..	May	Well No. 1	25.9	1.05	.00	.10	Do. vegetable debris ..	Do. ..	
159	Do. ..	Do.	Do. No. 2	21.0	1.05	.12	.09	Scanty, do. ..	Do. ..	Executive Engineer.
160	Do. ..	Do.	Do. No. 3	30.1	1.39	.12	.09	Do. do. ..	Do. ..	
161	Poona ..	January	Dispense tank ..	6.3	.56	.04	.05	Do. do. ..	Good ..	
162	Do. ..	Do.	Canal ..	5.6	.56	.04	.05	Do. do. ..	Do. ..	
163	Do. ..	February	Filtered water ..	4.2	.56	.04	.01	Do. paramœcia ..	Do. ..	Deputy Sanitary Commissioner, C. R. District.
164	Do. ..	Do.	Canal do. ..	3.5	.49	.09	.06	Do. do. ..	Fair ..	
165	Do. ..	Do.	Pandharpur tank ..	9.8	1.19	.00	.05	Do. diatoms ..	Good ..	
166	Do. ..	Do.	Mhasvad Canal No. 1 ..	11.9	1.96	.04	.08	Do. confervæ ..	Fair ..	
167	Do. ..	Do.	Do. do. No. 2 ..	16.8	1.96	.08	.10	Do. diatoms ..	Good ..	Do. do. do.
168	Do. ..	Do.	Stand-pipe, Sângola Road ..	11.2	1.19	.04	.12	Do. do. ..	Fair ..	
169	Do. ..	March	Mhasvad tank ..	11.9	2.10	.04	.09	Do. vegetable debris ..	Do. ..	
170	Do. ..	April	Canal water ..	5.6	.63	.05	.10	Do. confervæ ..	Do. ..	
171	Do. ..	Do.	Filtered water ..	2.8	.63	.04	.09	Do. vegetable debris ..	Do. ..	Executive Engineer.
172	Do. ..	May	Canal ..	4.9	.63	.00	.04	Do. do. ..	Good ..	
173	Do. ..	Do.	Filtered water ..	6.3	.63	.00	.06	Do. paramœcia ..	Do. ..	
174	Do. ..	Do.	Canal do. ..	7.0	.77	.04	.10	Do. vegetable debris ..	Fair ..	
175	Do. ..	Do.	Do. do. ..	2.8	.77	.04	.05	Nil. nil. ..	Good ..	Executive Engineer, Nira Canal.
176	Do. ..	June	Holkar tank, filtered ..	21.0	3.50	.08	.28	Scanty, vegetable debris ..	Bad ..	
177	Do. ..	Do.	Do. unfiltered ..	26.0	3.50	.15	.38	Do. paramœcia ..	Do. ..	
178	Do. ..	July	Canal water ..	4.9	.63	.08	.05	Scanty, vegetable debris ..	Fair ..	
179	Do. ..	Do.	Filtered do. ..	9.1	.77	.08	.10	Do. do. ..	Do. ..	Executive Engineer.
180	Do. ..	Do.	Nanjarikar's kundi ..	19.6	1.05	.04	.14	Do. confervæ ..	Bad ..	
181	Do. ..	Do.	Khadakvâsâ canal ..	4.2	.63	.04	.04	Do. do. ..	Good ..	
182	Do. ..	Do.	Somwar Peth ..	23.0	1.05	.08	.16	Do. do. ..	Bad ..	
183	Do. ..	Do.	Sadashiv Peth ..	21.0	1.19	.03	.08	Do. do. ..	Fair ..	Secretary, Municipality.
184	Do. ..	Do.	Kasha Peth ..	7.7	.63	.00	.04	Do. do. ..	Good ..	
185	Do. ..	August	Canal ..	4.2	.56	.05	.06	Do. vegetable debris ..	Do. ..	
186	Do. ..	Do.	Filtered water ..	4.2	.56	.05	.04	Do. do. ..	Do. ..	
187	Do. ..	September	Spring No. 1 ..	9.1	.56	.05	.06	Do. do. ..	Do. ..	J. E. Whiting, Esq., C.E.
188	Do. ..	Do.	Do. No. 2 ..	2.8	.63	.05	.05	Do. do. ..	Do. ..	
189	Do. ..	Do.	Do. No. 3 ..	1.4	.56	.04	.03	Do. do. ..	Do. ..	
190	Do. ..	Do.	Canal water ..	2.3	.63	.01	.06	Do. paramœcia ..	Do. ..	
191	Do. ..	Do.	Dispense tank ..	2.1	.56	.00	.03	Do. vegetable ..	Do. ..	Executive Engineer.
192	Do. ..	November	Canal ..	1.4	.56	.00	.09	Do. rotifers ..	Fair ..	
193	Do. ..	Do.	Filtered water ..	1.4	.56	.01	.04	Do. confervæ ..	Do. ..	
194	Parandhar ..	February	Well No. 1 ..	5.6	.70	.05	.10	Do. vegetable debris ..	Do. ..	
195	Do. ..	Do.	Do. No. 2 ..	4.9	.63	.01	.04	Do. do. ..	Good ..	Medical Officer, Station Hospital.
196	Do. ..	Do.	Do. No. 3 ..	9.1	.98	.01	.01	Do. do. ..	Do. ..	
197	Do. ..	Do.	Do. No. 4 ..	6.3	.77	.01	.03	Do. do. ..	Do. ..	
198	Do. ..	Do.	Do. No. 5 ..	4.2	.77	.01	.18	Do. do. ..	Bad ..	
199	Do. ..	Do.	Do. No. 6 ..	4.2	.63	.00	.10	Do. do. ..	Fair ..	Medical Officer, 24th Regiment B.I.
200	Do. ..	March	Tank ..	6.3	.63	.80	.25	Do. diatoms ..	Bad ..	
201	Do. ..	November	Semi-underground tank ..	2.8	.63	.04	.15	Do. paramœcia ..	Do. ..	
202	Râipur ..	January	Amba tank ..	9.1	2.45	.09	.19	Scanty, paramœcia ..	Do. ..	
203	Do. ..	Do.	Handi do. ..	9.8	1.54	.08	.27	Do. do. ..	Do. ..	Civil Surgeon.
204	Do. ..	Do.	Bagar do. ..	4.2	.42	.01	.13	Copious, do. ..	Fair ..	
205	Do. ..	Do.	Pankhati do. ..	10.5	.70	.01	.29	Do. do. ..	Bad ..	
206	Râjkot ..	June	Moonjka river ..	20.3	.73	.04	.11	Scanty, vegetable debris ..	Fair ..	Medical Officer, Station Hospital.
207	Do. ..	Do.	Lalpoore do. ..	10.5	1.19	.00	.07	Do. do. ..	Do. ..	
208	Sâtârâ ..	May	Drinking well ..	19.6	1.12	.01	.12	Scanty, paramœcia ..	Do. ..	
209	Do. ..	Do.	Subtrashree talâv ..	44.1	1.68	.75	1.38	Copious, algæ ..	Bad ..	
210	Do. ..	Do.	Mangla do. ..	23.3	1.19	.75	.50	Scanty, vegetable debris ..	Do. ..	Medical Officer, Station Hospital.
211	Do. ..	Do.	Machi do. ..	26.6	1.19	.69	.53	Do. rotifers ..	Do. ..	
212	Do. ..	Do.	Dudh do. ..	13.3	1.12	.21	.28	Do. paramœcia ..	Do. ..	
213	Do. ..	Do.	Sursagar do. ..	25.2	1.68	.21	.98	Do. do. ..	Do. ..	
214	Do. ..	Do.	Anmunt do. ..	31.5	1.82	.75	.72	Do. do. ..	Do. ..	Collector.
215	Do. ..	Do.	Mahuda do. ..	18.2	.77	.32	.88	Do. algæ ..	Do. ..	
216	Sholâpur ..	February	Sângola ..	34.3	3.64	.16	.74	Do. vegetable debris ..	Do. ..	
217	Do. ..	Do.	Do. well ..	29.4	3.01	.08	.76	Do. do. ..	Do. ..	
218	Sukkur ..	January	Railway do. ..	71.4	7.00	.08	.18	Copious, paramœcia ..	Do. ..	Civil Surgeon.
219	Do. ..	Do.	Well ..	30.1	6.58	.13	.33	Scanty, paramœcia ..	Do. ..	
220	Do. ..	February	Tâpti river ..	24.5	4.48	.08	.10	Do. vegetable debris ..	Fair ..	
221	Do. ..	Do.	Main stream river ..	26.6	4.48	.05	.10	Do. do. ..	Do. ..	
222	Do. ..	Do.	Side do. do. ..	23.8	4.48	.09	.11	Do. do. ..	Do. ..	Executive Engineer.
223	Do. ..	May	Sarthana water ..	28.0	6.44	.08	.09	Do. do. ..	Do. ..	
224	Do. ..	Do.	Kampsey do. ..	31.6	6.16	.05	.11	Do. do. ..	Do. ..	
225	Do. ..	Do.	Tâpti river, low tide ..	36.4	6.86	.08	.17	Do. paramœcia ..	Bad ..	
226	Do. ..	Do.	Do. do. high tide ..	37.8	7.00	.04	.14	Copious, vegetable debris ..	Do. ..	Secretary, Municipality.
227	Do. ..	June	Source not stated ..	39.2	6.93	.32	.20	Scanty, vegetable debris ..	Do. ..	
228	Do. ..	Do.	Do. do. ..	39.2	6.72	.04	.20	Do. do. ..	Do. ..	
229	Do. ..	Do.	Do. do. ..	37.8	6.65	.03	.18	Do. do. ..	Do. ..	
230	Do. ..	June	Tâpti river ..	44.3	7.49	.11	.44	Scanty, vegetable debris ..	Bad ..	Collector.
231	Do. ..	Do.	Do. ..	54.6	17.64	.63	.07	Copious, do. ..	Fair ..	
232	Do. ..	August	Mission House tank ..	3.5	1.05	.07	.20	Scanty, paramœcia and vorticella. ..	Bad ..	
233	Do. ..	Do.	Tank ..	2.8	1.05	.08	.15	Do. do. and vegetable debris. ..	Do. ..	
234	Do. ..	September	Majua gate well ..	71.4	21.08	.11	.08	Do. paramœcia ..	Do. ..	Executive Engineer.
235	Do. ..	Do.	Kella Peth well ..	217.7	60.06	.04	.10	Do. vegetable debris ..	Do. ..	
236	Do. ..	Do.	River water ..	9.8	.49	.04	.11	Abundant, do. ..	Fair ..	
237	Do. ..	Do.	Mina's well ..	10.9	.49	.01	.08	Scanty, do. ..	Good ..	
238	Do. ..	October	Tâpti river ..	7.7	1.05	.00	.09	Do. paramœcia ..	Fair ..	Superintendent, Jail.
239	Do. ..	Do.	Do. ..	12.6	1.05	.00	.06	Do. do. ..	Do. ..	
240	Do. ..	November	Do. ..	16.1	1.47	.01	.07	Copious, vegetable debris ..	Good ..	
241	Do. ..	Do.	Do. ..	17.5	1.89	.00	.06	Scanty, paramœcia ..	Do. ..	
242	Thâna ..	October	Pokran tank ..	10.5	1.19	.03	.37	Do. do. ..	Bad ..	Collector.
243	Do. ..	November	Jail water ..	9.8	1.26	1.07	.16	Do. do. ..	Do. ..	
244	Do. ..	Do.	Pokran tank surface ..	7.0	1.12	.09	.14	Do. confervæ ..	Do. ..	
245	Do. ..	Do.	Pipe ..	8.4	1.12	.03	.14	Copious, monads ..	Do. ..	
246	Do. ..	Do.	Railway Station pipe ..	7.7	1.12	.04	.12	Do. nematoda ..	Do. ..	Honorary Secretary.
247	Do. ..	Do.	Pokran tank below surface ..	7.7	1.12	.19	.14	Scanty, paramœcia ..	Do. ..	
248	Do. ..	December	Padkhal spring ..	7.7	1.75	.01	.11	Do. do. ..	Fair ..	
249	Trombay ..	April	Leper Asylum water ..	26.6	3.99	.09	.04	Do. do. ..	Do. ..	
250	Wâdi ..	March	Station well ..	42.7	2.24	.03	.21	Do. do. ..	Bad ..	Chief Engineer, G. I. P. Railway.

Section III.—Government Stores.

31. 298 articles coming under this section were examined during the year under report. The articles were :—

Commissariat Stores.

Samples of Malt liquor	...	130
" Lime-juice	...	43
" Tea	...	22
" Sugar	...	27
" Sundry foods	...	22
" Soap	...	16
" Sundries	...	8
		268

Ordnance and other Stores.

Samples of metals and alloys	...	14
" sundry Ordnance stores	...	5
" other Government stores	...	11
		30
		298

32. *Malt Liquor*.—Of the 130 samples of malt liquor examined during the year 20 were samples from five consignments of ale and porter imported by Government for the use of troops. The 20 samples referred to were taken from 10 hogsheads (2 samples per cask, as usual), 5 of these being ale and 5 porter, one sample drawn on arrival of the consignment and the other six days after landing. The following table shows the results of analysis of the second sample drawn from each cask :—

Brewery Number.	Description of Liquor.	Extract Gravity.	Beer Gravity.	Original Gravity.	Alcohol by volume per cent.	Acidity as Hydrated Acetic Acid per cent.
1	Ale ...	1018.0	1008.5	1060.5	6.80	.30
"	" ...	1015.6	1005.9	1059.1	6.96	.29
"	" ...	1015.6	1006.4	1056.6	6.56	.24
"	" ...	1016.0	1006.8	1057.0	6.56	.26
"	Porter ...	1020.3	1011.4	1059.7	6.33	.35
"	" ...	1018.9	1009.6	1060.4	6.64	.31
2	" ...	1015.0	1005.9	1055.5	6.49	.41
"	" ...	1016.2	1007.1	1056.3	6.49	.46
3	" ...	1020.8	1012.8	1051.4	5.63	.24
"	Ale ...	1020.2	1011.9	1052.5	5.87	.20

33. *Malt Liquor* : continued.—The remaining 110 samples were forwarded from various stations, having been rejected by Boards as unfit for use. The greater number of these were found on examination to contain too much acidity which was cured by the addition of bicarbonate of soda.

34. *Lime-juice*.—43 samples of lime-juice from casks tendered by contractors to the Commissariat Department were examined during the past year. Of these 10 were rejected as being of inferior quality.

35. *Tea*.—22 samples of tea were forwarded for examination from the Commissariat Department, being samples of supplies tendered by contractors. Of the 22 samples, one was rejected as being of inferior quality. The average results obtained from the 21 accepted samples were as follows :—

Specific gravity of a 10 per cent. decoction	...	1,010.37
Soluble ash per cent.	...	3.49
Insoluble ash per cent.	...	2.67

Total Ash per cent. ... 6.16

36. *Sugar and Sundry articles of Food*.—27 samples of sugar were forwarded by the Commissariat Department. Of these 3 were rejected as inferior,

the remainder being of good quality. The sundry articles of food consisted of :— (a) 7 tins of essence of beef, (b) 1 sample of vinegar, (c) 8 tins of preserved vegetables and cocoa, (d) 1 tin of condensed milk, (e) 1 sample of solidified soup; all of the above proved to be of good quality. In addition to these :—(f) three samples of lime-juice were forwarded for information as to the percentage of proof spirit which they contained, (g) 1 sample of bran which was rejected as unfit for use.

37. *Soap*.—16 samples of soap were examined for the Commissariat Department. Of these, 11 were samples of bar-soap and 5 were soft soap. The percentage of water present in each of these samples was reported to enable the Commissariat to estimate the price to be paid for the supply. The percentages of water in the 11 samples of bar-soap varied from 44·24 to 64·6 per cent. Two of these samples contained less than 50 per cent. of water, 2 over 50 and under 60 per cent., and 7 over 60 per cent. The percentages of water in the 5 samples of soft soap were as follows : 38·19, 38·94, 40·43, 40·44 and 42·10.

38. *Sundries*.—8 samples of this class were forwarded for examination during the year. Of these, 4 were samples of kerosine oil and 4 of bicarbonate of soda. Of the 4 samples of kerosine oil, 3 passed the required test, flashing above 77°F. (Abel flash).

The four samples of bicarbonate of soda examined with a view to ascertain their fitness or otherwise for curing the acidity of malt liquor, were found to be of good quality.

39. *Metals and Alloys*.—14 samples are classed under this head. Of these—

(a) Two samples of brass were forwarded by the Small Arms Ammunition Factory, Kirkee, information as to their percentage composition being required.

(b) Nine samples of mercury—five from the Small Arms Ammunition Factory and four from the Ordnance Department, Bombay, were found to be of good quality and fit for use in the manufacture of fulminate of mercury.

(c) Three samples of zinc rod from the Telegraph Department were found to be fit for use in batteries.

40. *Sundry Ordnance Stores*.—(a) Four samples of paper forwarded by the Small Arms Ammunition Factory, Kirkee, were found to be free from acidity and three were practically free from the presence of chlorine.

(b) One sample of canvas was found to be free from the possibility of spontaneous combustion.

41. *Other Government Stores*.—(a) Four samples of bichromate of potash forwarded by the Telegraph Department, were found to be of good quality.

(b) Six samples of ink from the Stationery Department were forwarded for report as to their relative quality and fitness for use in Government offices.

(c) One sample of quinine from the Medical Stores, Bombay, was found to be of good quality.

Section IV.—Customs and A'bkari Analyses.

42. During the past year 747 samples were examined for Customs and A'bkari purposes. The 747 samples analysed during the year are thus classified :—

Samples of wood spirit and methylated spirit	...	...	48
Do. of other imported supposed alcoholic liquids	...	...	118
Do. of country liquor	...	...	8
Do. of opium, gánja and salt	...	...	13
Do. of petroleum	...	...	512
Do. of explosives	...	...	46
Miscellaneous samples	...	...	2
			747

43. *Wood Spirit and Methylated Spirit*.—Of the 48 samples examined during the year, 24 were "wood spirit" and 24 methylated spirit. The 24

samples of "wood spirit" examined were found to be suitable for methylating purposes, and all the samples of methylated spirit were found to be effectively and permanently rendered unfit for human consumption.

44. *Other imported supposed Alcoholic liquids.*—118 samples of this class, comprising principally medicinal preparations and perfumes, were analysed during the year with a view to ascertain their alcoholic strength for the Customs Department. Of these, 36 were free or practically free from alcohol. The alcoholic strength of the remaining 82 samples, estimated as proof spirit was as follows:—

Under 20 per cent.	...	...	...	14 samples.
Between 20 and 50 per cent.	...	...	...	16 "
Do. 50 and 100	...	...	...	37 "
100 Over	...	...	...	15 "

45. *Country Liquor.*—8 samples of country liquor were examined for the Customs Department during the past year. Of these 2 were forwarded for the purpose of ascertaining the quantity of copper present. In each of these samples, copper was detected, but not to such an extent as to render the liquor unfit for human consumption. In one sample which was highly coloured, the colour was found to be due to suspended ferric oxide. In the remaining five samples information was required as to the alcoholic strength of the liquor.

46. *Opium, Gánja and Salt.*—13 samples of this class were examined during the year. Of these, 11 were of opium or suspected opium, 1 of salt and 1 of Cannabis Indica. Of opium samples, 5 came from the Bombay Customs, 3 were found to be free from opium, one of the three being supposed to be a sample of opium oil.

One sample from each of the following stations—Surat, Kaira, Akola, Alibág and Jhálávád:—

The samples from Surat and Kaira proved to be good opium, those from Akola and Alibág were found to be free from opium, and that from Jhálávád (Kháthiáwár) was found to be a poor sample of opium. Lastly, one sample from the Bánsda State, forwarded by the Collector of Surat, was examined in order to ascertain whether any noxious drug had been mixed with it, as the use of this opium was stated to have caused ill-effects in several people who had used it. Analysis, however, revealed the presence of nothing but opium.

The sample of salt was forwarded by the Bombay Customs and was found to consist, to the extent of about 24 per cent., of alkaline sulphates, the remainder being sodium chloride.

One sample box of cigarettes from the Bombay Customs was forwarded to ascertain the presence, if any, of an intoxicant. Cannabis Indica was found to be present.

47. *Petroleum.*—512 samples were examined during the year under report. Of these, 416 were samples from 26 cargoes of petroleum. Of these 26 cargoes, 19, consisting of 1,554,600 cases of Russian oil came from Batoum and 7, consisting of 369,700 cases of American oil came from New York. The 19 cargoes of Russian oil gave the following results upon examination:—"Abel flash" between 75° and 85°F., specific gravity between 791 and 816. The 7 cargoes of American oil gave the following results:—"Abel flash" between 74° and 104°F., specific gravity between 777 and 794. All samples examined passed the required test.

48. *Petroleum continued.*—The 96 remaining samples classed as petroleum and forwarded by the Customs Department during the year, comprised (a) 24 samples of lubricating oil, all of which had a flashing point above 200°F. and consequently not liable to duty under Act II of 1888; (b) 37 samples described as "turpentine," 24 of which were found to contain petroleum, probably in the form of kerosine, in varying proportions.

(c) Thirteen samples variously described and chiefly consisting of paints in which the solvent used was petroleum, gave the following results:—

5	had a flashing point over 200°F.
8	Do. . do. 76°F.
	but below 200°F.

(d) 22 samples taken from a consignment of 20 drums described as "Economic Protective Composition" and "Economic Antifouling Composition" (10 drums of each), all having a flashing point below 73°F., the samples described as "antifouling composition" flashing and burning continuously at a temperature as low as 50°F. This was the subject of a case brought before the Chief Presidency Magistrate, Bombay, by Government against the importer, and it was contended by the defendant that unless it could be proved that at least 40 gallons of absolute dangerous petroleum were present in the total contents of the drums, the case for Government could not stand. It was found, however, that more than 40 gallons of dangerous petroleum could be obtained by distillation and the consignment was confiscated and ordered to be destroyed. This case is of much interest, for the compositions, when they arrived in the Laboratory, were found to have separated into two layers, the lower layer being almost as hard as India rubber and the upper layer consisting of a highly inflammable liquid which alone gave all the indications of dangerous petroleum. The results of the examination of this liquid were first given in evidence at the first hearing of the case, but it was contended that the whole contents of each drum *after mixing*, could alone be legally tested according to the Act. This was afterwards done, the mixing of the contents not affecting the flashing point first ascertained. When it is understood that it took hours of hard work with bamboo poles to effect this mixing of the contents on account of the solid consistence of the paint-like material at the bottom of each drum, it becomes obvious that the liquid floating above this solid layer was, to all intents and purposes, dangerous petroleum, though apparently it would have escaped the operations of the Act, had it not been proved that the mixed contents upon distillation, gave rather more than 40 gallons of absolute dangerous petroleum, whereas over 68 gallons of the unmixed liquid were found in the drums. It might easily happen in a similar case that a quantity of such liquid were present, measuring more than 40 gallons but giving a distillate of less than 40 gallons of absolute dangerous petroleum and yet such a consignment would pass, whereas the supernatant liquid contents would in fact have all the properties of dangerous petroleum.

49. *Explosives*.—46 samples are included under this head, all of which were submitted to the tests described by the Explosives Act, all passing the required test. The 46 samples comprised 37 samples of dynamite, 6 of gelatine dynamite, 1 of roburite, 1 of blasting fuse and 1 of detonators.

Section V.—Miscellaneous.

50. 107 samples of this section are thus classified :—

Samples of food, &c. ...	...	...	...	22
" of water ...	...	...	...	44
" of earth, &c. ...	...	...	...	29
" of lime-stone and cement...	...	...	...	4
" of sundry substances ...	...	...	...	8
				107

The 22 samples of food include :—

(a) 10 samples of aerated water, 2 of which from Deesa were found to be unfit for use on account of contamination with organic impurity in one case and with copper in the other.

(b) Two samples of almond oil.

(c) Two samples of cocoanut oil and 1 of cocoanut cake, all of good quality.

(d) Three samples of wine from Aden; the casks originally containing the wines from which these samples were taken had been submerged in Aden harbour for three months and upon examination were found good and fit for use.

(e) One sample each of rice, sugar, flour and spice, all of good quality.

51. *Water*.—The 44 samples of sea water include—(a) 38 samples from the Secretary to the Colaba Outfall Committee taken at different distances from the shore, with a view to ascertain the extent of sewage contamination at the various distances.

(b) One sample of sewage water from the Deputy Executive Engineer to the Municipality, Bombay.

(c) Two samples of water from Gadag examined as to their fitness for washing clothes.

(d) Two samples of water intended for use in locomotive boilers, forwarded by the Locomotive Superintendent of the Great Indian Peninsula Railway, Parel.

(c) One sample of water from Mhow, intended for use in the boiler of the Steam Bakery at that station, forwarded through the Storekeeper General, Bombay.

52. *Earth, &c.*—The 29 samples of this class include:—

(a) Nine samples of earth forwarded for examination by the Inspector of the Great Indian Peninsula Railway Police, and taken from various stations with a view to ascertain the similarity, if any, of the composition of any one of eight of the samples with that of the ninth sample which had been taken from a bag, in a case of theft, where earth had been substituted for rupees. Two samples were found to resemble that taken from the bag.

(b) Two samples of clay forwarded by the Executive Engineer of Kamptee.

(c) Eighteen samples of mud forwarded by the Secretary to the Colába Outfall Committee, and taken at varying distances from shore for the purpose of arriving at some conclusion as to the distance to which sewage contamination could be detected.

53. *Lime-stone and Cement.*—Three samples of lime-stone sent by the Executive Engineer of Meywár State and 1 sample of cement sent by the Executive Engineer of Tánša Water Works; this sample had the following composition:—

Calcium carbonate	...	...	...	...	56.59
Silicic acid	...	...	...	...	22.15
Magnesia	...	...	...	...	.74
Ferric oxide and alumina	...	..	...	...	10.29
Sand, &c., insoluble in acid	...	...	...	...	1.87
Alkaline salts	...	...	...	...	5.52
Loss by incineration	..	...	...	...	2.84
					100.00

54. *Sundry Substances.*—The eight samples thus classified include:—

(a) One sample of tin from the Superintendent of Mátherán and one tinned cooking pot from the Staff Surgeon, Poona, the tin being found in both cases to be free from lead.

(b) Two samples of dye sent by the Chief Presidency Magistrate, Bombay, for comparison, one (the original sample) being found to be five times as strong as the sample from the stock supplied and said to be of the same strength.

(c) One sample of mineral forwarded by the Collector of Bijápur and found to consist principally of ferric oxide and aluminium silicate.

(d) One sample of stone from Hyderabad (Deccan), opinion being required as to its suitability or otherwise for use in the bottom of a tank; this sample being very friable was considered unfit for the purposes indicated.

(e) One sample of quinine forwarded from Kárwár for examination of the colouring matter, as to whether it was Government quinine or otherwise. The colouring matter was found to be the same as that used to colour Government quinine.

(f) One sample of a greasy sediment taken from the cylinders of hydro-pneumatic carriages and forwarded for analysis by the Superintendent of the Gun Carriage Factory, Bombay, and found to have the following composition:—

Moisture	...	...	...	...	16.05
Mineral matter, principally ferric oxide	...	...	...	...	50.47
Organic matter soluble in ether (fat)	...	...	...	...	13.60
Insoluble	...	...	...	...	19.88
					100.00

55. The duties of Assistant Chemical Analyser to Government were efficiently performed by Assistant Surgeon M. G. Deshmukh, M. D., during eleven months of the year under report, these duties being carried out during the remaining month by Assistant Surgeon N. K. Kallianwalla, both conducting their work carefully and to my entire satisfaction.

I have the honour to be,

Sir,

Your most obedient Servant,

T. D. COLLIS BARRY, F.R.S.E., F.C.S., F.I.C., Surgeon,
Acting Chemical Analyser to Government.

Annual Reports : Report of the Chemical Analyser to Government for the year 1890.

No. 1470.

GENERAL DEPARTMENT.

Bombay Castle, 27th April 1891.

Letter from the Surgeon General with the Government of Bombay, No. s.b.—197, dated 13th March 1891—Submitting with his remarks the report of the Chemical Analyser to Government for the year 1890.

RESOLUTION.—During the year 1890 the Chemical Analyser investigated and reported on 353 medico-legal cases and examined 250 samples of potable water and 1,152 of Government stores and miscellaneous articles.

2. The number of medico-legal cases, though slightly less than in the year 1888, was larger than in the previous years. Of these 190 were cases of suspected poisoning of human beings and 117 of suspected cattle poisoning. The percentage of detections of poison in cases of the former class has steadily decreased since 1886. Arsenic was detected in 32 cases, opium in 9, dhatura in 4, and other poisons in 22 cases. In all 87 persons were poisoned, of whom 35 died, the largest number of deaths (21) being caused by arsenic.

3. The number of cases of suspected cattle poisoning rose from 84 in the previous year to 117 in the year under review. This number is stated to be the largest number of cases of cattle poisoning ever referred to the Chemical Analyser for examination. Poison was detected in 63 cases, the number of animals killed being 58.

4. The attention of the District Superintendents of Police should be particularly invited to the remarks made by the Chemical Analyser in paragraph 29 of his report and they should be asked to instruct their subordinates to furnish that officer with the fullest information possible in connection with the cases sent to him for examination. The Chemical Analyser should report to the District Magistrates any cases in which the information supplied is obviously insufficient.

5. During the year under review 250 samples of water were forwarded for examination as against 260 in the previous year. Of the samples examined 143 were pronounced to be bad. Of the 28 samples sent from Ahmednagar only one was reported to be of good quality.

6. The articles examined for the Commissariat and Ordnance Departments were of the usual descriptions. Of the 747 samples examined for the Customs and A'bkári Departments 512 were of petroleum, 48 of wood or methylated spirit and 118 of other imported alcoholic liquids. His Excellency the Governor in Council has read with interest the Chemical Analyser's report of the examination of 22 samples of a "composition" containing dangerous petroleum. The Commissioner of Customs, Salt, Opium and A'bkári should be requested to favour Government with any remarks he may have to offer on the points raised by the Chemical Analyser in paragraph 48 (d) of his report. All the 46 samples of explosives are reported to have passed the required test. 107 samples of miscellaneous articles were also examined during the year.

W. L. HARVEY,

Acting Under Secretary to Government.

To

The Surgeon General with the Government of Bombay (with copies of the report),

[P. T. O.]

The Sanitary Commissioner for the Government of Bombay, The Municipal Commissioner for the City of Bombay, The Commissioner of Police, Bombay, All District Superintendents of Police, All Collectors and District Magistrates, including those in Sind, The Commissioner in Sind, The Commissioner, N. D., The Commissioner, C. D., The Commissioner, S. D., The Commissioner of Customs, Salt, Opium and A'bkari, The Revenue Department of the Secretariat, The Judicial Department of the Secretariat, The Compiler, General Administration Report for 1890-91.	}	With copies of the report.
The Editors' Table, Bombay, The Editors' Table, Poona, <i>care of</i> the City Magistrate, Poona, The Editor of the <i>Dhārwar Vritta</i> (for his own use and for the use of the other Editors in Dhārwar), The Government of India, The Secretary of State for India.	}	By letter.